STATE OF CALIFORNIA -- THE RESOURCES AGENCY GRAY DAVIS, *Governor*

DEPARTMENT OF WATER RESOURCES
SAN JOAQUIN DISTRICT
3374 EAST SHIELDS AVENUE
FRESNO, CA 93726-6913

April 13, 1999

Dr. Richard Higashi
University of California-Davis
Department of Land, Air and
Water Resources
1 Shields Avenue
Davis, California 95616-8627

Dear Dr. Higashi:

This is a letter to assure you of our intent to collaborate and express our support for your proposal to CALFED entitled "Rapid-Response Assessment of Selenium "Fixation" Rate into the Foodchain by Analysis of Volatile Biogenic Selenium Compounds." We believe that the proposed project directly addresses a major gap of information needed to manage water quality in the San Joaquin River.

Currently, all selenium monitoring measures only its pools, not the rate at which selenium is entering the foodchain. The well-known case of Belews Lake, into which selenium discharge was terminated in 1985, still shows elevated selenium levels in the foodchain pools a decade later. Therefore, measurement of selenium pools cannot provide the critical *direction-of-change* of selenium ecotoxic risk, that is needed to manage water quality. Unfortunately, there has been no such method available.

But now, the UC-Davis group proposes to test a potentially viable, while reasonably practical, means to obtain such a measurement. While not "real-time," the proposed analysis of biogenic volatile selenium can be an invaluable "rapid-response" approach because it provides a parameter that is critical, yet currently not measurable. Possibly, the results of this work could establish correlations that would lead to an inexpensive method for real-time monitoring of selenium concentrations in drainage waters.

On behalf of the entity responsible for managing the Department of Water Resources Agricultural Drainage Program and the CALFED funded Real-time Monitoring Program for the San Joaquin River, I would like to express the District's

support for this proposal. We believe that this investigation opens the possibility for greatly enhancing the value and utility of the CALFED-funded "San Joaquin River Real-time Water Quality Management Program." It also has potential to enhance many other phases of selenium research and monitoring throughout the San Joaquin Valley, the San Joaquin River and the Delta.

Sincerely

Jack Enchan for

Louis A. Beck, Chief
San Joaquin District

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Fresno County Board-Supervisor
2281 Tulare St # 301
Fresno, CA 93721-2105
Phone: 559-488-3529

13 April, 1999

This letter is to notify your county of our intent to submit a proposal to the CALFED Bay-Delta Program, due on April 16, which will be performed in part in your county. The information is listed below. If funded, CALFED will notify you of the project after close of their confidentiality period.

If you have any questions, please feel free to contact me at the number below.

Sincerely,

Teresa W-M. Fan

Rapid-Response Assessment of Selenium "Fixation" Rate into the Foodchain by Analysis of Volatile Biogenic Selenium Compounds

Primary Contacts:
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Phone: 530-752-1450; Fax: 530-752-1552

Participants and Collaborators:
Jack Erickson, California Department of Water Resources, Fresno
Leslie Grober, Central Valley Regional Water Quality Control Board, Sacramento

Type of Organization and Tax Status:
University, non-profit

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Merced County Board Administrative Offices
2222 M St
Merced, CA 95340-3729
Phone: 209-385-7637

13 April, 1999

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1100 H St
Modesto, CA 95354-2338
Phone: 209-525-6333

13 April, 1999

This letter is to notify your county of our intent to submit a proposal to the CALFED Bay-Delta Program, due on April 16, which will be performed in part in your county. The information is listed below. If funded, CALFED will notify you of the project after close of their confidentiality period.

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Phone: 209-478-6091

13 April, 1999

This letter is to notify your county of our intent to submit a proposal to the CALFED Bay-Delta Program, due on April 16, which will be performed in part in your county. The information is listed below. If funded, CALFED will notify you of the project after close of their confidentiality period.

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Type of Organization and Tax Status:
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San Joaquin River Real-time Water Quality Management Program

(Other Service — water quality monitoring and modeling)

Proposed by

California Department of Water Resources
San Joaquin District
3374 East Shields Avenue
Fresno, CA 93726

In collaboration with

San Joaquin River Management Program (SJRMP)
California Regional Water Quality Control Board, Central Valley Region (CRWQCB-CVR)
California State Water Resources Control Board (SWRCB)
California Department of Fish and Game (DFG)
United States Bureau of Reclamation, San Joaquin Valley Drainage Office (USBR-SJVD)
United States Bureau of Reclamation, Central Valley Operations (USBR-CVO)
United States Geological Survey (USGS)
Lawrence Berkeley National Laboratory (LBNL)
Local SJR basin stakeholders (reservoir operators, water and drainage districts)

Program Co-Investigators
San Joaquin River Management Program
Water Quality Subcommittee

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October 1998
SAN JOAQUIN RIVER REAL-TIME WATER QUALITY MANAGEMENT PROGRAM
proposed by
California Department of Water Resources
San Joaquin District

Scope of Services

Background

The San Joaquin River Real-time Water Quality Management Program (SJRRWQMP) uses telemetered stream stage and salinity data and computer models to simulate and forecast water quality conditions along the lower SJR. Its primary goal is to increase the frequency of meeting SJR water quality objectives for salinity, thereby reducing the number and/or magnitude of high quality releases made specifically for meeting SJR salinity objectives. The SJR water quality issues that are directly addressed by the Program include:

- California Regional Water Quality Control Board, Central Valley Region (CRWQCB-CVR) water quality objectives for SJR salinity near Vernalis, just upstream from the SJR's entrance into the South Delta. Current SJR salinity management involves releasing water stored in New Melones Reservoir when EC objectives are exceeded to lower the Vernalis EC and maintain compliance.
- Operation of wetlands that discharge brackish water into Mud and Salt sloughs from the periodic drawdown of specially-managed ponds.
- Operation of the USBR's Grassland Bypass Channel Project that regulates agricultural drainage discharge into Mud Slough near its confluence with the SJR. This project, which began in September 1996 and is scheduled to last up to five years, has a compliance monitoring program that establishes monthly load limits for salt and selenium.
- Release of Spring and Fall pulse flows resulting from Anadromous Fish Restoration Program (AFRP) implementation. These seasonal pulse flows temporarily enhance the SJR's assimilative capacity for salt, thereby increasing the amount of brackish wetland and/or agricultural drainage that can be discharged into SJR tributaries without exceeding Vernalis salinity objectives.

The potential application of real-time water quality management techniques to address water quality problems in the San Joaquin River (SJR) was demonstrated by the SJRMP Water Quality Subcommittee and described in a June 1997 final report fulfilling the Committee's obligations under a $250,000 USBR Challenge Grant. The project showed the feasibility of monitoring and modeling the salinity of the lower SJR on a daily basis. A series of workshops were held and technical papers were written to describe the results of 18 months of flow and water quality forecasting on the San Joaquin River. The demonstration project accomplished the following:

- Expanded the number of monitoring sites temporarily providing telemetered stage and water quality data, and reinstated full operation of gaging stations: (a) along the Merced River near Stevinson (the USGS discontinued this station in 1995); (b) at Mud Slough, (c) Salt Slough and (d) Crows Landing. Developed protocols for polling these stations twice weekly and rapidly updating flow ratings to allow real-time operation, flow and EC forecasting.
- Developed analytical tools to collect, process and display daily streamflow and salinity data (and by extension, SJR assimilative capacity).
- Executed a $50,000 service contract with Systech Engineering, Inc. to develop a Windows™-based graphical user interface (GUI) computer program to display forecast model input and results (discharge, salinity, and remaining assimilative capacity) along a 60-mile reach of the lower SJR. The GUI has Internet upload and download capabilities that expedite the collection of model inputs and the dissemination of water quality forecasts. The demonstration project established an Internet FTP (file transfer protocol) site on the DWR San Joaquin District local area network used exclusively for GUI operation.
- Developed weekly water quality forecasts of daily Vernalis discharge and salinity since February 1996, and posted forecasts in arrears on an electronic bulletin board operated and maintained by the USBR (sjrwqop@sacto.mp.usbr.gov).
- Established a memorandum of understanding (MOU) (Attachment 4) to express a commitment to the operation, maintenance and expansion of the Program's Network.

The demonstration project successfully provided a forum for information exchange among entities with an interest in managing SJR water quality. The demonstration project also established a trained interagency staff and an operational system featuring a custom GUI with Internet upload and download capabilities. Funding for continued water quality modeling and management activities ended in July 1997 with the termination of the demonstration project's USBR Challenge Grant.

Funding from the current CALFED grant will be used to restart the flow and water quality forecasting program on the San Joaquin River, upgrade the existing monitoring network, install and maintain sensors at key monitoring sites (including new west-side tributary locations and the San Luis Drain) and increase utilization of the results of these activities by CALFED organizations and beneficiaries.

Scope of Project

The work will be completed in two years. During the first year of the project, the surface water monitoring station network will be upgraded and expanded. Operation of the water quality model will be reinitiated while network expansion is in progress and will continue through the second year. An existing agreement with the USGS for station operation and maintenance of DWR/USGS stations will be amended to include upgrading and O & M costs for Tuolumne River

near Modesto monitoring station. A subcontract with the CRWQCB-CVR for water quality analysis and model operation will also be executed. Another subcontract will be executed with Lawrence Berkeley National Laboratory for conducting travel-time studies, model operation, conducting workshops and training sessions for stakeholders. A third subcontract will be executed with Systech Engineering Inc., for upgrading the graphical user interface to display information on the expanded monitoring network. Annual progress reports will be submitted to CALFED and MOU signatories.

Objectives and Benefits of Project

The primary stressor addressed by the Program is contaminants entering the lower SJR. The main objective of the project is to facilitate the control and timing of wetland and agricultural drainage to coincide with periods when dilution flow is sufficient to meet Vernalis salinity objectives. By increasing the frequency of meeting Vernalis EC objectives, the project may reduce the number and/or magnitude of high quality releases (e.g, releases of Stanislaus River flows from New Melones Reservoir) made specifically for meeting Vernalis EC objectives. The water saved can be used later to increase SJR basin streamflow during critical periods for anadromous fish restoration efforts. Besides chinook salmon and steelhead trout, species and species groups benefitting from increased SJR streamflow include delta smelt, longfin smelt, splittail, white and green sturgeon, striped bass, estuarine fishes, large invertebrates, and Bay-Delta aquatic foodweb organisms.

Other specific objectives and benefits include:

1. Reduction in conflicts between reservoir operators, wetlands managers, and agricultural drainers in meeting Vernalis salinity objectives.
2. Improved SJR and Bay-Delta water quality for agricultural, drinking water, industrial, and recreational beneficial uses. Under its authority, the project will be managed to dovetail with CALFED's Water Quality Program, the geographic scope of which is limited to the legally defined Delta.
3. Expanded and improved monitoring stations with telemetered streamflow, temperature and EC sensors capable of delivering real-time information. Streamflow temperature data from these stations will be instrumental in the development of river temperature models. Species benefitting from such adaptive stream temperature management as possible modifications to reservoir facilities and stream channels, include white and green sturgeon, chinook salmon, steelhead trout, and American shad. Additionally, EC data may be employed in monitoring adaptive management strategies that deal with use of the lower SJR by splittail.
4. Increased understanding and management of activities that affect SJR water quality. The model may qualify as a tool to assess the impact of other management practices that attempt to reduce the pollutant load into the lower SJR and Bay-Delta. The project will enhance existing water quality programs to monitor aquatic contaminants (e.g., selenium and agricultural chemicals) that may cause acute toxicity and mortality or long-term

toxicity and associated detrimental physiological responses. The discharge into the SJR of agricultural drainage high in selenium is a serious contaminant problem in the lower SJR basin and Bay-Delta. Selenium has caused reproductive failure in sensitive fish species and developmental deformities in waterfowl and shorebirds because it bioaccumulates in plant and animal tissue to levels that can be toxic to higher trophic organisms. The project plans to enhance existing sampling for selenium and boron at key locations through the purchase of portable water sampling and quality monitoring units that will be used in short-term investigations of lower SJR basin water quality by SJRMP participants (e.g., Assessment of the Stanislaus River Corridor Below Goodwin Dam.)

5. Facilitate the dissemination of shift and rating table data for Network stations. Telemetered stage data are adjusted according to shifts in the relationship between stage and discharge established at each gaging locale to generate preliminary estimates of stream discharge. Preliminary discharge data, such as that posted on CDEC's Internet site, are often significantly affected by the subsequent determination of such shifts. The preliminary estimates of SJR discharge at Network sites along the lower SJR generated by the project will help verify the accuracy of preliminary real-time data posted on CDEC.

Cooperating Agencies

DWR - San Joaquin District: The San Joaquin District operates and maintains several surface water monitoring stations in the San Joaquin Valley. The SJR Real-time Demonstration project utilized flow data from six DWR stations. With the proposed network expansion, this number will increase to 8 stations, and would include flow, electrical conductivity and temperature data. Installation and equipment costs attributed to these 8 stations will be funded by CalFed grant. Monthly operation and maintenance costs will be funded out of District funding sources.

USBR - SJVD: Since the 1996 Challenge Grant, Reclamation has continued to make significant commitments through staff-time and funding to support the SJR Real-time program. The SJR Real-time program compliments directly Reclamation's Grasslands Bypass Channel Project, the Refuge Water Supply Acquisition Program, the Cooperative Streamflow Program, and CVP operations in the Delta.

For the two-year SJR Real-time program, Reclamation has committed the following:

- funding and expertise to operate, maintain, and upgrade two important water quality monitoring stations at Ripon and Vernalis.
- funding LBNL to design, install, and calibrate an new station on Mud Slough to monitor water flowing from wetlands.
- funding USGS to operate and maintain five water quality monitoring stations associated with the Grasslands Bypass Channel Project.
- funding staff-time to support the collection, review, and presentation of water quality data by the SJR Real-time program.

During year one, Reclamation has committed more than $200,000 to support the SJR Real-time program.

Grasslands Water District: As an interested party, Grasslands has committed to partially fund the installation of a control structure and concrete pad at the new Mud Slough station.

Task Order

Seven primary sub-tasks will be accomplished through the cooperative effort of the collaborating agencies. These sub-tasks are as follows:

1. Program Management
2. Preparation of Subcontracts and Agreements
    1. Lawrence Berkeley National Laboratory contract
    2. CRWQCB-CVR contract
    3. USGS agreement
    4. Systech Engineering, Inc. contract
1. Water Quality Monitoring Plan - Quality Assurance Project Plan
2. Expand Real-time Water Quality Monitoring Network
3. Operate and Maintain New and Existing Real-time Monitoring Stations
4. Water Quality Sampling and Analysis
5. Modeling and Management Activities

A description, actions involved, schedule of deliverables, the responsible staff and agency for each sub-task is indicated below.

Sub-Task No. 1
Program Management

Act as program manager to San Joaquin River Real-Time Program. Oversee and facilitate the development of subcontracts, and the completion of program goals and objectives. Responsibilities will include assigning resources, scheduling tasks, reviewing results, and developing quarterly and annual reports (DWR Senior Engineer).

Schedule: Task is ongoing and terminates with the completion of the program. Reports will be issued on a quarterly and annual basis.
Deliverables: Satisfactory completion of the goals and objectives of the program. Quarterly and annual reports.

Sub-Task No. 2
Preparation of Subcontracts and Agreements

Sub-task 2 involves the preparation of subcontracts and agreements directly related to Program activities (DWR Senior Engr.). These subcontracts include the following:

California Regional Water Quality Control Board - Central Valley Region Contract

For QAQC purposes, the Program includes periodic collection and analysis of total dissolved solids (TDS), selenium and boron. CRWQCB-CVR responsibilities will include monitoring water quality at critical San Joaquin River basin sites to serve as a check on data collected at real-time monitoring stations. CRWQCB-CVR responsibilities will also include model operation, report writing, developing monitoring plans, and conducting workshops and demonstrations.
Schedule: Contract preparation is underway and will be completed by the end of January 1999.
Deliverables: Contract describing CRWQCB-CVR duties and responsibilities as they relate to the real-time monitoring program. Draft and final contract to be delivered upon completion.

Lawrence Berkeley National Laboratory Contract

Travel-time dye studies will help establish the timing influence of tributaries to the San Joaquin River. LBNL will serve as backup to DWR staff for such duties as station troubleshooting and data preprocessing. LBNL will also work with Systech Engineering, Inc. to modify the graphical user interface (GUI) computer program to include the expanded monitoring network. In addition these duties, LBNL responsibilities will also include model operation, report writing, developing monitoring plans, and conducting workshops and demonstrations.
Schedule: Contract preparation is underway and will be completed by the end of January 1999.
Deliverables: Contract describing LBNL duties and responsibilities as they relate to the real-time monitoring program. Draft and final contract to be delivered upon completion.

Systech Engineering, Inc. Contract

A Windows™-based graphical user interface (GUI) computer program to display forecast model input and results was developed for the demonstration project by Systech Engineering, Inc.. With the expansion of the monitoring network, this program will require modification to display model inputs and results for several additional monitoring stations.
Schedule: Contract preparation is underway and will be completed by the end of January 1999.
Deliverables: Contract to upgrade GUI software. Draft and final contract to be delivered upon completion.

USGS Agreement

DWR has an existing agreement with the USGS to cooperatively operate and maintain certain surface water monitoring stations in the San Joaquin Valley. An amendment to this agreement to include the upgrade of their Tuolumne River near Modesto station to include real time EC and temperature monitoring will be prepared. The agreement will also include regular operation and maintenance of discharge and EC/temperature sensors at this monitoring station.
Schedule: The agreement will be prepared by the end of January 1999.

Deliverables: Cooperative agreement to operate this station for real-time monitoring uses. Draft and final contract to be delivered upon completion.

Sub-Task No. 3
Water Quality Monitoring Plan
Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) will be prepared to document the procedures used by the interagency project team for activities related to the collection, processing, storage, and publication of surface-water flow and water quality data (LBNL and CRWQCB-CVR staff).

Schedule: A draft document has already been prepared. The final QAPP will be completed by January 1, 1999.
Deliverables: Final Quality Assurance Project Plan report.

Sub-Task No. 4
Expand Real-time Water Quality Monitoring Network.

Sub-task No. 4 will expand the monitoring network by installing conductivity and temperature sensors at six existing telemetered gaging stations and installing telemetry and sensors at two untelemetered stations in the lower SJR basin.
Actions:

6. Plan, coordinate, prepare final equipment and manpower requirements, and schedule work to be performed (WR Engineer Associate DWR, 48 hours, first year only).
7. Acquisition of equipment (telemetry, dataloggers, EC/temperature sensors, spare equipment, and associated peripheral equipment) for expanding and upgrading monitoring station network (Associate Engineer DWR, 24 hours, first year only).
8. Equipment for network expansion:
    5. 2 - Telemetry communications ($2,100 each)
    6. 2 - Data collection platforms ($2,400 each)
    7. 2 - Stage height gauges and peripherals ($1,400 each)
    8. 8 - EC/temperature sensors and peripherals ($1,700 each)
    9. 8 - Miscellaneous materials and supplies ($500 per station)
1. Repair and upgrade station for new equipment. Install telemetry and sensors for real-time discharge and EC/temperature sensors at (W.R. Tech II, DWR, 160 hours):
    10. San Joaquin River @ Maze Road Bridge
    11. Tuolumne River @ Hickman Bridge.
2. Repair and upgrade station for new equipment. Install EC/temperature sensors at the following sites (W.R. Tech II, DWR, 324 hours, first year only):
    1. San Joaquin River near Stevinson

2. Merced River near Stevinson
3. Merced River near Cressey
4. Merced River near Snelling
5. San Joaquin River @ Patterson
6. Stanislaus River @ Orange Blossom Bridge

6. Upgrade existing telemetered monitoring station to include real-time EC and temperature at Tuolumne River near Modesto ($2,300 as per USGS agreement).

3. Equipment for USGS station (Tuolumne River near Modesto):
   1. 1 - Data collection platforms ($2,400 each)
   2. 1 - Stage height gauge and peripheral ($1,400)
   3. 1 - EC/temperature sensor and peripheral ($1,700)
   4. 1 - Miscellaneous materials and supplies ($500)

4. Equipment for Grasslands WD station (Mud Slough below Gun Club Rd.):
   1. 1 - Telemetry communications ($2,100 each
   2. 1 - Data collection platform ($2,400 each)
   3. 1 - Stage height gauge and peripheral ($1,400)
   4. 1 - EC/temperature sensor and peripheral ($1,700)
   5. 1 - Miscellaneous materials and supplies ($500)

5. Setup and calibration of datalogger, telemetry, discharge gauge and EC/temperature sensors at following sites (Engineer DWR, 72 hours, first year only):
   1. San Joaquin River @ Maze Road Bridge
   1.
   2. Tuolumne River @ Hickman Bridge.
   3. San Joaquin River near Stevinson
   4. Merced River near Stevinson
   5. Merced River near Cressey
   6. Merced River near Snelling
   7. San Joaquin River @ Patterson
   8. Stanislaus River @ Orange Blossom Bridge

6. Spare equipment for Program when required (one full set of equipment per year).
   1. 1 - Data collection platforms ($2,400 each)
   2. 1 - Stage height gauge and peripheral ($1,400)
   3. 1 - EC/temperature sensor and peripheral ($1,700)
   4. 1 - Miscellaneous materials and supplies ($500)

Schedule: Expansion of the monitoring network will begin when CALFED funding is secured. Installation of equipment will be dependant of several factors: availability of technical staff, weather, condition of stations, and availability of equipment. Installation of equipment to upgrade and expand monitoring network will commence as soon as possible during the first year of program operation and should be completed by the end of calendar year 1999.

Deliverables:

7. Permanent upgrade to real-time EC/temperature capability for 7-stations (6-DWR, 1-USGS and 1-Grasslands WD). EC and temperature data available on DWR's California Data Exchange Center (CDEC) website.
8. The addition to real-time status of two previously untelemetered DWR stations measuring flow, EC and temperature.
9. Telemetry, data collection, sensors and miscellaneous equipment and materials for upgrade of 1-USGS, 1-Grasslands and 8-DWR stations.
10. Spare equipment for repair and maintenance of DWR stations.

Sub-Task No. 5
Operate and Maintain New and Existing Real-time Monitoring Stations

Real-time stage and conductivity data are downloaded and processed to yield preliminary estimates of current discharge. Accurate forecasts of real-time SJR assimilative capacity require accurate estimates of real-time discharge and EC, which in turn, require the periodic measurement of discharge and regular maintenance and cleaning of sensors at Network stations. Regular monthly maintenance of DWR operated stations will be funded by District flood management and basic data program sources. Regular monthly maintenance of all but one (Tuolumne River @ Modesto) of the USGS operated stations in the Real-time Program will be funded by the USBR. Regular monthly maintenance of Grasslands Mud Slough station will also be funded by the USBR during the two year program. Regular monthly maintenance of the USGS Tuloumne River @ Modesto station will be funded through the Real-time program.

Since the Real-time program requires an accurate and reliable data source on a daily basis, from time to time it will be necessary to troubleshoot and repair equipment problems that occur between the regular scheduled maintenance. The Real-time program will fund DWR staff to be responsible for troubleshooting these problems. Under their contract, LBNL staff will serve as backup when DWR staff is not available.

Actions:
11. Operate and maintain EC/temperature sensors at the following telemetered monitoring station (USGS agreement):
    1. Tuolumne River near Modesto ($10,200 per year)
12. Troubleshooting and repair of 19-stations:
    1. Engineer DWR, 152 hours per year
    2. LBNL staff, 40 hours per year (backup)

Schedule: Operation and maintenance of one USGS station (Tuolumne River near Modesto) will begin when station equipment is upgraded to include EC/temperature monitoring and will continue to the completion of the two-year program. Troubleshooting and repair of network station equipment will be initiated as required throughout the term of the program.

Deliverables: With the more intense operation and maintenance schedule that the project will provide, there will be an increase in the accuracy of stage, flow, EC and temperature data collected at network stations to the benefit all data users. Maintenance summary will be included in quarterly reports.

Sub-Task No. 6
Water Quality Sampling and Analysis

Periodic collection and analysis of water samples for total dissolved solids (TDS), selenium and boron is the focus of the project's two-year water quality sampling plan. Periodic collection and analysis of water samples for total dissolved solids (TDS) help maintain reliable site-specific correlations of TDS and EC. Although boron and selenium cannot be measured in real-time, concentration data from sampling sites will be used for retrospective model runs. Sampling will be conducted on a weekly basis for key sites and more intensive daily monitoring will be conducted periodically at specific locations. Sampling program will follow the methods and procedures established in the QAPP report.

Actions:

13. Weekly sample collection, processing, and analysis for boron and selenium at ten sites and daily sample collection, processing, and analyses for boron and selenium at select sites (CRWQCB-CVR student, 2,860 hours per year).
14. Sample processing and analyses for TDS for select samples (CRWQCB-CVR lab, 250 samples at $16 per sample per year).
15. Weekly sample processing and analyses for B and Se (CRWQCB-CVR lab, 520 samples at $35 per sample per year).
16. Daily sample processing and analyses for B and Se (CRWQCB-CVR lab, 513 samples at $35 per sample per year).
17. Time-of-travel dye studies (LBNL staff plus 100 samples at $1 per sample per year).
18. Prepare summaries of the results of water quality sampling program to be included in the quarterly and annual reports.

1.

Schedule: Water quality sampling will begin when funding is secured and will continue through the course of the 2-year program. Summaries of water quality sampling will be completed on a quarterly and annual basis.

Deliverables: Provides a check on the accuracy and reliability of real-time EC data through correlation to TDS monitoring. Analysis of B and Se monitoring will help to identify where contaminants are being introduced into the river system and the loads entering the Delta. Quarterly and annual summaries included in program reports (see sub-task 1).

Sub-Task No. 7
Modeling and Management Activities

Staff will assemble and process real-time monitoring data, poll stakeholders on upcoming river management activities, run the forecasting model and post results on the Internet on a weekly basis. Stakeholders will be consulted on a quarterly basis on opportunities to improve SJR water quality. Workshops will be conducted periodically to solicit interest and participation by new stakeholders in Program activities. Stakeholders will be instructed on how to use the Program's GUI software, and Program information will be disseminated on the SJRMP home page. Annual progress reports will be submitted to CALFED and MOU signatories.

Actions:

19. Assemble and pre-process raw stage and EC data for San Joaquin and tributary sites; weekly (DWR Engineer 624 hours, LBNL staff 24 hours).
20. Input and maintain processed data; weekly (DWR Assoc. Engineer 104 hours).
21. Poll stakeholders on current river management activities; weekly (DWR Assoc. Engineer 208 hours, LBNL staff 104 hours).
22. Run forecasting model; weekly (DWR Assoc. Engineer 520 hours, LBNL staff 295 hours, CRWQCB-CVR staff 312 hours, CRWQCB-CVR student 1040 hours).
23. Maintain and post model results on GUI (DWR Assoc. Engineer 416 hours).
24. Maintain and post model results to USBR SJRWQOP Bulletin Board and Web Page; weekly (LBNL staff 104 hours).
25. Conduct workshops , training sessions, and demonstrations with water agencies, water districts, and the public to promote use of forecasting model interface and forecasts (DWR Assoc. Engineer 96 hours, LBNL staff 96 hours plus travel, CRWQCB-CVR staff 96 hours).
26. Attend SJRMP meetings to provide monthly updates (DWR Assoc. Engineer 96 hours, LBNL staff 96 hours plus travel, CRWQCB-CVR staff 48 hours).
27. Write quarterly and annual reports (DWR Assoc. Engineer 168 hours, LBNL staff 72 hours, CRWQCB-CVR staff 72 hours).
28. Training DWR staff in model operation (DWR Assoc. Engineer 60 hours, DWR Engineer 60 hours, LBNL staff 36 hours plus travel, CRWQCB-CVR staff 24 hours).
29. Upgrade and maintenance of GUI software (LBNL staff 24 hours plus travel, Systech Engineering Inc. contract)
30. Miscellaneous unforeseen needs (salary raises, equipment failures, additional work to upgrade stations, additional travel and perdiem costs, etc.)

1.

Schedule: Quarterly reports of progress and an annual report summarizing the results of weekly forecasts of flow and EC on the San Joaquin River. The annual report will be written in a style for publication by California Agriculture or similar journal. Web site and DWR PC will be kept current with forecast data for the period of the CALFED grant.

Deliverables:

31. Weekly water quality forecasts (posted to SJRWQOP Bulletin Board, USBR web page, and available to stakeholders on Real-time GUI).
32. Stakeholder workshop presentation materials and a schedule of workshops will be provided.
33. Quarterly and annual progress reports (see sub-task 1). Summary of workshop minutes will be included in quarterly reports.
34. Upgrade GUI software.

Task Order Schedule of Deliverables:

Subtask No.	Task /Deliverable Description	Start Date (mo/yr)	Due Date (mo/yr)
1	**Program Management**	1/99	12/00
	1. Quarterly fiscal reports.		4/99, 7/99, 10/99, 1/00, 4/00, 7/00, 10/00, 1/01
	2. Annual progress reports summarizing data, results and activities.		*1/00, 1/01*
2	**Preparation of Subcontracts and Agreements**	**12/98**	**1/99**
	1. Draft Subcontracts	12/98	1/99
	2. Final Subcontracts	1/99	2/99
3	**Water Quality Monitoring Plan QAPP**	**7/98**	**1/99**
	1. Draft QAPP report		completed
	2. Final QAPP report		1/99
4	**Expand Real-time Water Quality Monitoring Network**	**1/99**	**12/99**
	1. Permanent installation of telemetry, stage, and EC/temp monitoring equipment for two DWR stations and upgrade to real-time EC/temp for one USGS and six DWR stations.	1/99	12/99
	2. Equipment purchased for network expansion.	1/99	12/99
	3. Updates of monitoring network expansion will be included in quarterly and annual reports (see sub-task 1).	(see sub-task 1)	(see sub-task 1)
5	**Operate and Maintain New and Existing Real-time Monitoring Stations**	**1/99**	**12/00**
	1. Regular monthly O & M	1/99	12/00
	2. Troubleshooting and repair	1/99	12/00
6	**Water Quality Sampling**	**1/99**	**12/00**
	1. Provide a check on the accuracy and reliability of real-time EC data as it correlates to TDS values.	1/99	12/00
	2. Water quality summaries included in quarterly and annual reports (see sub-task 1).	(see sub-task 1)	(see sub-task 1)

7	**Modeling and Management Activities**	**1/99**	**12/00**
	1. Weekly water quality forecasts (posted to SJRWQOP Bulletin Board, USBR web page, and available to stakeholders on Real-time GUI).	1/99	weekly
	2. Stakeholder Workshop Presentation materials.	1/99	3/99
	3. Modeling progress reports included in quarterly and annual reports (see sub-task 1).	(see sub-task 1)	(see sub-task 1)

Task Order Budget - Two Year Program

Year Number 1

No.	Project Task/Sub-task	Direct Labor Hours	Direct Salary & Benefits	Overhead Labor (General Admin & Fees)	Service Contracts & Agree.	Equip. Costs	Misc., Travel & Other Direct Costs	Total Costs
1	**Program Management** (DWR Senior Engr.)	260	$10,720	$4,481				$15,201
2	**Subcontract preparation** (DWR Senior Engr.)	60	$2,474	$1,034				$3,508
3	**Prepare Quality Assurance Project Plan.**							
	LBNL staff				$3,164			$3,164
	CRWQCB-CVR staff				$1,477			$1,477
4	**Expand Real-time Monitoring Network.**							
	1. Acquisition of equipment. Permanent installation of telemetry, stage, EC/temp equip. for two DWR stations and upgrade to real-time EC/temp for one USGS and six DWR stations.							
	DWR Engr Associate	48.4	$1,603	$670			$126	$2,399
	DWR Assoc. Engineer	24	$834	$349			$126	$1,309
	DWR Engineer	72	$1,527	$638			$252	$2,417
	DWR Tech II	484	$13,305	$5,562			$1,008	$19,875
	USGS agreement				$2,300			$2,300
	2. Equipment for network expansion (8-DWR stations).							
	Telemetry comm.(2)					$4,526		$4,526
	Data collection platform (2)					$5,172		$5,172
	Stage meter (2)					$3,017		$3,017
	EC/temp sensor (8)					$14,654		$14,654
	Miscellaneous materials (8)					$4,310		$4,310
	3. Equipment for USGS station.							

	EC/temp sensor (1)					$1,831		$1,831
	Miscellaneous materials (1)					$539		$539
	4. Equipment for Grasslands Mud Slough near Gun Club Rd.							
	Telemetry comm.(1)					$2,263		$2,263
	Data collection platform (1)					$2,586		$2,586
	Stage meter (1)					$1,508		$1,508
	EC/temp sensor (1)					$1,831		$1,831
	Station house (1)					$1,078		$1,078
	Miscellaneous materials (1)					$1,078		$1,078
	5. Spare equipment for monitoring network.							
	Telemetry comm.(1)					$2,263		$2,263
	Data collection platform (1)					$2,586		$2,586
	Stage meter (1)					$1,508		$1,508
	EC/temp sensor (1)					$1,831		$1,831
	Miscellaneous materials (1)					$539		$539
5	**Operation and maintenance of monitoring stations. O&M of DWR stations will be covered under other programs.**							
	1. Supervision, planning and scheduling of twice-monthly operation and maintenance of 8-DWR stations (DWR Engr. Associate, WR).	78	$2,597	$1,085				$3,682
	2. Twice-monthly operation and maintenance of 8-DWR stations (DWR Tech II).	784	$21,552	$9,009			$3,024	$33,585
	3. Operate and maintain EC/temp sensors at USGS station Tuolumne River near Modesto.				$10,200			$10,200
	4. Troubleshooting and repair of 19-Real-time stations.							

	DWR Engineer	144	$3,054	$1,277				$4,331
	LBNL staff (backup)				$3,516			$3,516
6	**Water quality sampling.**							
	1. Weekly & daily sample collection, processing and analysis for B and Se (CRWQCB-CVR student).				$42,500			$42,500
	2. Lab analysis for B and Se collected weekly (520 samples per year at $35 per sample)				$18,200			$18,200
	3. Lab analysis for B and Se collected dailly (513 samples per year at $35 per sample)				$17,955			$17,955
	4. Lab analysis for TDS samples (250 samples per year at $16 per sample).				$4,000			$4,000
	5. Time-of-travel dye studies (LBNL staff 24 hours + 100 samples at $1 per sample)				$2,346			$2,346
7	**Modeling and general program activities.**							
	1. Assemble and pre-process real-time data weekly from 19-stations.							
	DWR Engineer	624	$13,235	$5,532				$18,767
	LBNL staff (backup)				$2,110			$2,110
	2. Input and maintain processed data; weekly (DWR Assoc. Engineer)	104	$3,615	$1,511				$5,126
	3. Poll stakeholders on current river management activities; weekly.							
	DWR Assoc. Engineer	208	$7,230	$3,022				$10,252
	LBNL staff				$9,142			$9,142
	4. Run forecasting model: data input, calibration, test run, confer, adjustments, and final run; weekly.							
	DWR Assoc. Engineer	520	$18,075	$7,555				$25,631
	LBNL staff				$25,931			$25,931

	CRWQCB-CVR staff				$19,204			$19,204
	CRWQCB-CVR student				$15,454			$15,454
	5. Maintain and archive data. Post model results to GUI (DWR Assoc. Engineer).	416	$14,460	$6,044				$20,505
	6. Maintain and post model results to USBR bulletin board and web page (LBNL staff).				$9,142			$9,142
	7. Conduct workshops, training sessions, and demonstrations.							
	DWR Assoc. Engineer	96	$3,337	$1,395			$504	$5,236
	LBNL staff				$11,318			$11,318
	CRWQCB-CVR staff				$5,909			$5,909
	8. Attend meetings.							
	DWR Assoc. Engineer	96	$3,337	$1,395			$504	$5,236
	LBNL staff				$9,494			$9,494
	CRWQCB-CVR staff				$2,954			$2,954
	9. Write reports and bulletins.							
	DWR Assoc. Engineer	168	$5,840	$2,441				$8,281
	LBNL staff				$6,329			$6,329
	CRWQCB-CVR staff				$4,432			$4,432
	10. Training DWR staff in model operation.							
	LBNL staff (trainer)				$4,172			$4,172
	CRWQCB-CVR staff (trainer)				$1,477			$1,477
	DWR Assoc. Engineer (trainee)	60	$2,086	$872				$2,957
	DWR Engineer	60	$1,273	$532				$1,805
	11. Upgrade and maintenance of GUI software.							
	LBNL staff				$2,219			$2,219
	Systech Engineering, Inc.				$5,000			$5,000
	12. Contingency fund for miscellaneous unforeseen needs (i.e. salary raises, equipment						$32,000	$32,000

	failures, additional work to upgrade stations, additional travel & per diem, etc.)							
No.	**Project Task/Sub-task**	**Direct Labor Hours**	**Direct Salary & Benefits**	**Overhead Labor (General Admin & Fees)**	**Service Contracts & Agree.**	**Equip. Costs**	**Misc., Travel & Other Direct Costs**	**Total Costs**
	Total 1st Year Costs	**4,307**	**$130,153**	**$54,404**	**$239,944**	**$53,120**	**$37,544**	**$515,165**
	Total 2nd Year Costs	**3,498**	**$107,052**	**$44,748**	**$220,134**	**$8,727**	**$36,032**	**$416,693**
	Total Program Costs	**7,805**	**$237,205**	**$99,152**	**$460,078**	**$61,847**	**$73,576**	**$931,857**
	2nd Year costs include all 1st Year costs with the exception of sections 2, 3, 4.1-4.4, 10 and 11.							
	DWR Staff		**Direct & Benefits Hourly Rate**	**Indirect & Surcharge Hourly Rate**	**Total Hourly Rate**			
	Senior Engineer		$41.23	$17.23	$58.46			
	Assoc. Engineer		$34.76	$14.53	$49.29			
	Engineer		$21.21	$8.87	$30.08			
	WR Assoc. Engineer		$33.12	$13.84	$46.96			
	WR Tech II		$27.49	$11.49	$38.98			

Expenditure	**First Year Costs**	**Second Year Costs**	**Total Program Costs**
LBNL	$88,882	$79,327	$168,208
CRWQCB-CVR	$133,562	$130,607	$264,169
USGS	$12,500	$10,200	$22,700
Systech Engineering, Inc.	$5,000	$0	$5,000
Equipment costs	$53,120	$8,727	$61,847
DWR wages (direct salary, benefits, indirect costs and surcharge)	$184,558	$151,800	$336,357
Misc., travel and other direct costs.	$37,544	$36,032	$73,576
Total Annual Costs	**$515,165**	**$416,693**	**$931,857**

FISCAL YEAR BUDGET

	Fiscal Year	**Direct Labor Hours**	**Direct Salary & Benefits**	**Overhead Labor (General Admin &**	**Service Contracts & Agree.**	**Equip. Costs**	**Misc., Travel & Other Direct**	**Total Costs**

				Fees)			Costs	
	1998-99	2,558	$76,627	$32,030	$129,877	$48,756	$19,528	$306,819
	1999-00	3,498	$107,052	$44,748	$220,134	$8,727	$36,032	$416,693
	2000-01	1,749	$53,526	$22,374	$110,067	$4,364	$18,016	$208,346
	TOTALS	**7,805**	**$237,205**	**$99,152**	**$460,078**	**$61,847**	**$73,576**	**$931,857**